

Search History

Database Details

Set	Term Searched	Items	
S1	SOFTWARE(N)METRIC?	464	Display
S2	S1 AND INDEX?	22	Display
S3	RULE(W)BASED OR PREDEFINED(W)RULE?	1553	Display
S4	S1 (S) S3	1	Display
S5	SOFTWARE(N)(METRIC? OR MEASUREMENT?)	567	Display
S6	S3 AND S5 AND INDEX? AND PY<1996	3	Display
S7	S3 (S) INDEX?	22	Display
S8	S5 AND S7	0	Display
S9	S5(S)S3	1	Display
S10	S5 AND S3 AND PY<1996	5	Display
S11	S5 AND FORMAT?(N)CONVERSION?	1	Display
S12	SCHEMA(W)TUNNEL?	0	Display
S13	S5 (S) UNIVERSAL?	1	Display
S14	(DATA)(W)(DEFINITION? OR COMPONENT?)	908	Display
S15	S5 (S) S14	0	Display
S16	S5 AND S14 AND PY <1996	0	Display
S17	S5 (S) SOFTWARE?	566	Display
S18	S5 (S) SOFTWARE? (S) (METRIC?)	466	Display
S19	S18 AND PY<1996	452	Display
S20	S19 AND INDEX?	22	Display

Format

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#Documents

10

Show Database Details for:

275: IAC (SM) Computer Database (TM) ▼

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US PAT NO: 5,123,103 :IMAGE AVAILABLE: L3: 11 of 12
 DATE ISSUED: Jun. 16, 1992
 TITLE: Method and system of retrieving program specification and
 linking the specification by concept to retrieval
 request for reusing program parts
 INVENTOR: Noriko Ohtaki, Machida, Japan
 Yoshiaki Nagai, Yokohama, Japan
 Yuji Magamatsu, Kawasaki, Japan
 Eiki Chigira, Tokyo, Japan
 ASSIGNEE: Hitachi, Ltd., Tokyo, Japan (foreign corp.)
 APPL-NO: 07/109,269
 DATE FILED: Oct. 15, 1987
 FRN-PRIOR: Japan 61-246791 Oct. 17, 1986
 Japan 62-33232 Feb. 18, 1987
 INT-CL: :5: G06F 15/40
 US-CL-ISSUED: 395/600; 364/282.1, 283.4, 274, 286, DIG.1
 US-CL-CURRENT: 707/5; 364/222.81, 222.82, 225, 225.1, 234, 237.2, 274,
 274.1, 274.2, 274.8, 282.1, 282.4, 283.3, 283.4, 286,
 DIG.1; 395/703, 710
 SEARCH-FLD: 364/200MSFile, 900MSFile
 REF-CITED:

U.S. PATENT DOCUMENTS

4,283,771	8/1981	Chang	364/200
4,384,329	5/1983	Rosenbaum	364/300
4,455,619	6/1984	Masui	364/900
4,497,039	1/1985	Kitakami	364/200
4,498,142	2/1985	Advani	364/900
4,506,326	3/1985	Shaw	364/900
4,555,771	11/1985	Hayashi	364/900
4,558,413	12/1985	Schmidt	364/200
4,611,298	9/1986	Schuldt	364/900
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4,864,497	9/1989	Lowry	364/200
4,891,441	6/1989	Nixon	364/300
4,894,771	1/1990	Kunii	364/300

ART-UNIT: 232
 PRIM-EXMR: Thomas C. Lee
 ASST-EXMR: Eric Coleman
 LEGAL-REP: Fay, Sharpe, Beall, Fagan, Minnich & McKee

ABSTRACT:

Herein disclosed is a software information reusing system comprising: a

data base for storing software information; a dialogue display terminal; thereby processing the information inputted from the display terminal. First retrieval information of the software information is registered as data related with a link of a data information related concept. If second retrieval information is not in the registered data, it is judged on the basis of the link of the related concept whether or not third retrieval information related therewith exists. The data base is retrieved on the basis of the third retrieval information. As a result, it is possible: to form a dictionary data base including a noun dictionary and a synonym dictionary for analyzing and generalizing the data object of the specification to be newly registered; for a user unacquainted with the business knowledge to automatically extract a proper retrieval keyword from a retrieval request sentence describing the software coming into the mind of the user; and to judge from the relations between the keyword information and the before and behind words whether or not even a composed word left either unregistered as one word or unknown is the retrieval keyword, if even one of elements composing the composed word is found to have the corresponding keyword information.

17 Claims, 22 Drawing Figures

US PAT NO: 5,123,103 :IMAGE AVAILABLE:

L3: 11 of 12

CLAIMS:

=> d 13 1,5,11

1. 5,659,751, Aug. 19, 1997, Apparatus and method for dynamic linking of computer software components; Andrew G. Heninger, 395/685, 683, **710**
:IMAGE AVAILABLE:

5. 5,553,290, Sep. 3, 1996, Software packaging structure having **hierarchical** replaceable units; Nathaniel Calvert, et al., 395/703; 364/280, 286, DIG.1; **395/710** :IMAGE AVAILABLE:

11. 5,123,103, Jun. 16, 1992, Method and system of retrieving program specification and linking the specification by concept to retrieval request for reusing program parts; Noriko Ohtaki, et al., 707/5; 364/222.81, 222.82, 225, 225.1, 234, 237.2, 274, 274.1, 274.2, 274.8, 282.1, 282.4, 283.3, 283.4, 286, DIG.1; 395/703, **710** :IMAGE AVAILABLE:

US PAT NO: 5,261,100 :IMAGE AVAILABLE: L6: 19 of 20
 DATE ISSUED: Nov. 9, 1993
 TITLE: Method of software development
 INVENTOR: Tsutomu Fujinami, Kawasaki, Japan
 Hirohide Haga, Kyoto, Japan
 ASSIGNEE: Hitachi, Ltd., Tokyo, Japan (foreign corp.)
 APPL-NO: 07/363,509
 DATE FILED: Jun. 8, 1989
 FRN-PRIOR: Japan 63-144526 Jun. 10, 1988
 INT-CL: :5: G06F 15/40
 US-CL-ISSUED: 395/700, 650, 919, 922; 364/DIG.1, 275.1
 US-CL-CURRENT: 395/703; 364/225.6, 225.8, 234, 236.8, 237.2, 237.3,
 238.3, 243, 243.3, 259.4, 262, 265, 274, 274.2, 274.3,
 275.1, 286, 286.1, DIG.1; 395/706, 919, 922
 SEARCH-FLD: 364/200, 900; 395/600, 650, 700, 919, 922
 REF-CITED:

U.S. PATENT DOCUMENTS

4,330,822	5/1982	Dodson	364/200
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Shi-Kuo Chang, IEEE Software, vol. 4, pp. 29-39, Jan. 1987.
 Interactive Programming Environments, Barstow et al. 1984 pp. 370-413.
 Komiya, et al., "Automatic Programming by Fabrication of Reusable Program
 Components", Information Processing, vol. 28, No. 10, 1987, pp.
 1329-1345.

ART-UNIT: 237
 PRIM-EXMR: David L. Clark
 ASST-EXMR: John Loomis
 LEGAL-REP: Fay, Sharpe, Beall, Fagan, Minnich & McKee

ABSTRACT:

A program data managing apparatus comprising memories for storing as
 program data a source code, technique data on a process for making the
 source code, and intention data on intention to make the source code; a
 link indicative of the mutual relationship between program data; a
 display for displaying the relationship between the program data using
 the link; a link provided to indicate the relationship between a newly
 developed source code and the original program data from which the new
 source code derives; and a display for displaying the source code
 developed stepwise by that link and the related program data.

18 Claims, 34 Drawing Figures

=> d his full

(FILE 'USPAT' ENTERED AT 12:40:21 ON 15 JUN 1998)

L1	64	SEA SOFTWARE# (A) (METRIC# OR MEASUREMENT#)
L2	1066	SEA 395/70?, 71?/CCLS
L3	5	SEA L1 AND L2
L4	5	SEA L1 AND HIERARCH?
L5	24	SEA L1 AND INDEX?
L6	2	SEA L4 AND L5
L7	10	SEA L1 AND (INDEX?)/TI, AB, CLM
L8	1	SEA L1 AND INSTANTIAT?
L9	26	SEA L1 AND INSTANCE#
L10	27	SEA (HIERARCH?) (A) (INDEX#### OR INDICES)
L11	0	SEA L1 AND L10
L12	0	SEA L10 (P) SOFTWARE?
L13	13	SEA L10 AND SOFTWARE?

1. **5,699,310**, Dec. 16, 1997, Method and apparatus for a fully inherited object-oriented computer system for generating source code from user-entered specifications; Gary W. Garloff, et al., 395/701 :IMAGE AVAILABLE:

2. **5,606,661**, Feb. 25, 1997, Apparatus and method for scan-based testing in an object-oriented programming environment; Larry L. Wear, et al., 395/183.14, 704; 707/103 :IMAGE AVAILABLE:

3. **5,526,522**, Jun. 11, 1996, Automatic program generating system using recursive conversion of a program specification into syntactic tree format and using design knowledge base; Hiroshi Takeuchi, 395/702; 364/274.1, 274.3, 274.5, 280.4, 972.3, 973, DIG.1, DIG.2; 395/10, 922 :IMAGE AVAILABLE:

4. **5,261,100**, Nov. 9, 1993, Method of software development; Tsutomu Fujinami, et al., 395/703; 364/225.6, 225.8, 234, 236.8, 237.2, 237.3, 238.3, 243, 243.3, 259.4, 262, 265, 274, 274.2, 274.3, 275.1, 286, 286.1, DIG.1; 395/706, 919, 922 :IMAGE AVAILABLE:

5. **5,159,687**, Oct. 27, 1992, Method and apparatus for generating program code files; Joseph B. Richburg, 395/702, 50, 703, 922 :IMAGE AVAILABLE:

6. **5,123,103**, Jun. 16, 1992, Method and system of retrieving program specification and linking the specification by concept to retrieval request for reusing program parts; Noriko Ohtaki, et al., 707/5; 364/222.81, 222.82, 225, 225.1, 234, 237.2, 274, 274.1, 274.2, 274.8, 282.1, 282.4, 283.3, 283.4, 286, DIG.1; 395/703, 710 :IMAGE AVAILABLE:

(FILE 'USPAT' ENTERED AT 13:01:36 ON 14 JAN 1998)

L1	871 S 395/70?,71?/CCLS
L2	12 S ((INDEX?)(P)(HIERARCH?)) AND L1
L3	264 S SOFTWARE(A)(METRIC# OR MEASUR? OR TESTING)
L4	18 S L1 AND L3

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4.. 5,606,661, Feb. 25, 1997, Apparatus and method for scan-based testing
in an object-oriented programming environment; Larry L. Wear, et al.,
395/183.14, **704**; 707/103 :IMAGE AVAILABLE:

Search Options:

Search for both singular and plurals: YES
Search for spelling variants : YES
Display intermediate result sets : NO

Num	Search	Hits
#1	software? W/2 (metric? OR measur?)	717
#2	#1 AND (tree? OR hierarch?)	31
#3	#1 AND (rule-based OR expert OR knowledge?)	44

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(FILE 'USPAT' ENTERED AT 13:01:36 ON 14 JAN 1998)
L1      871 S 395/70?,71?/CCLS
L2      12 S ((INDEX?)(P)(HIERARCH?)) AND L1
L3      264 S SOFTWARE(A)(METRIC# OR MEASUR? OR TESTING)
L4      18 S L1 AND L3
L5      3 S (5129083 OR 5255385 OR 5485617)/PN
L6      0 S 5606661/UREF,BI
L7      2394 S (INSTANCE# OR INSTANTIAT?)(2A)(OBJECT# OR INDEX?)
L8      289 S L7 (20A)(CHNAGE# OR LINK#### OR DIFFEREN? OR RELATIONSHI
P#)
L9      27 S L1 AND L8
L10     2 S L3 AND L9
L11     9 S (MEASUREMENT)(W)(CLASS##)
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Display Sets

Search History

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S2	FRAMEWORK (5W) SOFTWARE (5W) MEASUREMENT?	0	Display
S3	SOFTWARE (5W) MEASUREMENT?	330	Display
S4	S3 (S) FRAMEWORK?	9	Display

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Search Options:

Search for both singular and plurals: YES
Search for spelling variants : YES
Display intermediate result sets : NO

Num	Search	Hits
#1	software W/2 measurement?	224
#2	#1 AND validation?	10

Set	Items	Description
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S2	100	S1 AND SOFTWARE?
S3	2	S2 AND METRIC?
S4	934	(SOFTWARE?) (S) (METRIC OR METRICS)
S5	114	(SOFTWARE?) (S) (METRIC OR METRICS) (S) (MEASUREMENT?)

L4 4.12

Set	Items	Description
S1	567	(SOFTWARE?) (N) (MEASUREMENT? OR METRIC?)
S2	6	S1 (S) INDEX?
S3	5208	RULE (W) BASED OR (KNOWLEDGE (W) (BASE? OR PROCESS?))
S4	34	S1 AND S3
S5	7	S4 AND INDEX?
S6	34	S4 AND PY <1996
S7	85	SOFTWARE (W) MEASUREMENT?
S8	2	S7 (S) (RULE? OR KNOWLEDGE? OR EXPERT (W) SYSTEM?)

=> d his

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(FILE 'USPAT' ENTERED AT 08:46:09 ON 14 JAN 1998)
L1      59 S SOFTWARE# (A) (METRIC# OR MEASUREMENT#)
L2      23 S L1 AND INDEX?
L3      1 S L2 AND (RULE(W)BASED OR EXPERT(W)SYSTEM# OR (KNOWLEDGE?(
W) (
L4      3 S L1 (P) (INDEX?)
L5      43 S 4751635/UREF,BI
L6      2311 S RULE(W)BASED OR EXPERT(W)SYSTEM# OR (KNOWLEDGE?(W) (BASE
OR
L7      4 S L5 AND L6
L8      30715 S 395/CLAS OR 707/CLAS OR 1/1/CCLS OR 705/CLAS
L9      10 S L1 AND L8
L10     1633 S (DATA) (2A) (DEFINITION#)
L11     1 S L1 AND L10
L12     466 S L6 (P) SOFTWARE#
L13     18 S L6 (P) SOFTWARE# (P) (MEASUREMENT# OR METRIC#)
L14     98 S (SOFTWARE#) (A) (RELIABLIT? OR MEASUREMENT# OR PRODUCTION#
OR
L15     2 S ((SOFTWARE#) (A) (RELIABLIT? OR MEASUREMENT# OR PRODUCTION
# O
L16     6 S L6 AND L14
L17     138 S 707/10/CCLS
L18     2 S L14 AND L17
L19     1 S 5274806/UREF,BI
L20     2 S L14 (P) (HETEROGENEOUS? OR COMPATIB? OR CONVERSION#)
L21     23 S 5159687/UREF,BI
L22     9 S L21 AND INDEX?
L23     3 S L6 AND L22
L24     3532 S SOFTWARE# (A) APPLICATION#
L25     205 S (PLURALITY OR MULTIPLE OR SEVERAL OR DIFFERENT) (5A) L24
L26     9 S L25 (P) (HETEROGENEOUS? OR COMPATIB? OR CONVERSION#)
L27     1 S 5708828/PN
L28     1 S L27 AND GENERIC
L29     1 S L27 AND INDEX?
L30     1 S L27 AND (TREE# OR NODE# OR HIERARCH?)
L31     0 S L27 AND (INDEX? (P) HIERARCH?)
L32     103 S L6 (P) INDEX?
L33     11 S L6 (P) INDEX? (P) (DATA) (P) (DEFINITION# OR COMPONENT# OR
PA
```

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01516949 SUPPLIER NUMBER: 12202262 (THIS IS THE FULL TEXT)
Go with the flow. (combining expert systems and flowcharts to develop
 knowledge bases) (Expert's Toolbox) (Tutorial)
Knaus, Rodger
AI Expert, v7, n6, p17(3)
June, 1992

TEXT:

Flowcharts and expert systems-what could seem farther apart?
Flowcharts remind us of punched cards and Fortran, and seem too rigid for the relatively unstructured knowledge behind an expert system. On the other hand, if you do have a flowchart, why waste time with expert systems instead of writing a program from the flowchart? Sometimes, however, this unlikely combination is useful because you can use flowcharts for knowledge acquisition, and expert-system shells and languages are an easy way to code flowcharts into runnable software. Also, a flow-chart-based **knowledge base** is easy to change.

KNOWLEDGE ACQUISITION

Let's start with knowledge acquisition. As a knowledge engineer, your goal is to extract problem-solving knowledge from the expert for a computerized **knowledge base**. Sometimes the experts have already organized the knowledge into a flowchart for their own use. This was the case for a patient-management expert system I wrote recently; an almost-complete flowchart was available in a technical bulletin for doctors.

Suppose a flowchart isn't available. For patient management and many other potential expert-system applications, the problem solver, whether human expert or expert system, gathers information and makes a determination using that information. Each problem situation is a dialog between the expert and client. As a knowledge engineer, you interview the expert, asking questions "What do you do first?"; "What information do you look for now?"; "What do you do now?"; "What are the possible situations that can occur next?"; "What are the conditions under which these situations occur?" Using these questions, we can lead the expert through one scenario, then go back to a choice point and take another branch, continuing the process until all choices are explored.

As we conduct the interview in this form, we record each dialog as a path in an emerging flowchart, adding actions, branches, and edges to the flowchart as needed with each successive dialog. The flowchart neatly summarizes the information so that the expert can inspect it for completeness. In addition, each phase of the dialog consists of reporting actions and decisions in a sequence similar to how they occur in practice; this makes the form in which knowledge is reported similar to the form in which it is used.

ENCODING FLOWCHARTS

That a flowchart existed for the patient-management problem was the good part; the bad part was that it grew to contain more than 60 boxes. Compared to recommended **software metrics**, many expert-provided flowcharts are too big or contain loops that don't map easily into structured code. Tasks performed by organizations, such as adding a new book to a library, also have complex flowcharts, especially when we try to capture procedures in practice rather than as formally defined.

While it's always possible to transform a flowchart into one containing only if-then-else branches, begin-end blocks, and while loops, this restructuring has several disadvantages: As descriptions of what should be done, the restructured flowcharts are often harder for the expert

to understand. This makes it harder for the expert to contribute to the development and maintenance of the system. Also, you make mistakes transforming the original flowchart into structured code. Finally, small changes to the original flowchart can require major changes to the restructured one. For these reasons, we want to encode the expert's flowchart in a straightforward, recognizable way into an expert system. Prolog and **rule-based** shells are ideal for this task.

To demonstrate some techniques for turning flowcharts into rules, we'll use the example in Figure 1, which is illustrative only. If we create one rule for each path from the top of the flowchart to the conclusion, we get the rule set shown in Listing 1. The if part of each rule contains the logical conditions that must be satisfied to follow a particular path to a conclusion box; that conclusion is in the then part of the rule.

As the path length from the top to the bottom of the flowchart increases, this logic-based approach becomes increasingly unwieldy, because the hypothesis contains one condition for each edge in the path. In addition, the number of paths flowing through an interior region of the flowchart increases, so a change in the flowchart affects a large number of rules.

We can overcome this problem by using a state variable. Its value, called the current state, tells us where in the flowchart we are at the moment. To represent the current state, we'll assign a unique name to each box in the flowchart and use these names as possible values of the state variable; in Figure 1, the box names appear just outside the box. Listing 2 shows rules for the flowchart rewritten using state variables. Now the complexity of each rule does not change, no matter how long or looping the paths through the flowchart become—although the chance for unexpected computational paths does increase as the flowchart becomes messier.

Now suppose that the expert finds that the original flowchart is not quite right. Each change to a path in the flowchart causes only one rule to change in the **knowledge base**, when using the state variables in the rules. In contrast, if we used conditions on paths, many rules would change. Likewise, there is no single, simple change in a structured program that mirrors a one-edge change in an underlying messy flowchart. Encoding the expert's original flowchart using state variables minimizes the work in responding to changes requested by the expert. It also helps experts understand how the expert system corresponds to their own knowledge.

Listing 3 shows Listing 1 in Prolog. The process predicate holds the expert system rules, and the other predicates run the rules. The when predicate tries to prove that its question argument has the answer specified in its second argument; consider moves the system to a new state; and conclude makes a recommendation to the user. A good strategy for when is backward chaining, with asking the user as a backup source of information; for the implementation details see "A Portable Engine," AI Expert, Jan. 1990. The resulting system uses forward chaining at the top level to execute a specified, overall problem-solving strategy, while leaving the details to be figured out by backward chaining. Global forward chaining with local backward chaining seems to represent a good compromise between the unpredictability of pure backward chaining and the detailed programming required for pure forward chaining; some shells, such as Exsys, offer this hybrid strategy as an option.

The basic structure of the Prolog flowchart program also handles multiple answer questions, such as "Which of the Ten Commandments has the candidate violated?" If we let when return a list of answers and make consider put each corresponding next state in the database, the program will eventually get around to each branch we chose.

As the flowchart gets bigger, your expert system might slow down. This happens if all the process rules are stored in a single linear list searched from the top each time a state is processed. Some Prologs like Quintus) **index** clauses on the first argument, automatically eliminating this problem. If your Prolog doesn't do this, you can program the technique yourself (Listing 4). First reprogram initialize to record the body of each process clause under the state in its head. Then modify process to try each rule of the current state in turn.

HELPING THE EXPERT

By looking at the rules derived from our flowchart, we see that a **knowledge base** of this type is really just a table in which each row represents one rule that corresponds to one line in the flowchart. An individual row is fully specified when we provide:

- * The current state that activates the rule
- * Tests that have to be satisfied for the rule to apply
- * Actions to be performed once the test is satisfied
- * The new current state after performing the actions
- * Whether additional rules can apply at the current state

Knowing that this is all we need for the top level of our expert system, we can say to the expert: First list all the situations or problem-solving steps that occur when you work on problems that the expert system should do (column 1 of the table). Then for each step you listed, list the questions you would ask and the answers you might receive (column 2). Now, for each partially filled-in row, complete the table. To complete a **knowledge base**, we would also have to ask an expert for conditions that imply the tests in the table so the finished system can do local backward chaining.

I hypothesize that filling in such a table is relatively easy for experts compared to writing if-then rules with complete logical conditions for tests and actions. This is because experts usually have years of practice, and they can replay in their minds what they do step by step. They also know and can identify situations where tests and actions ought to be considered, which is what we ask them to do in filling in the table.

On the other hand, writing complete logical conditions for rules is like explaining expertise to a novice; for both a novice and a computer, you can't assume that they will be able to fill in obvious details you leave out. By asking for information in a form that allows experts to replay their experience, and by coding with states the experts provide, we can construct, at least for interview-and-decide expert systems, a **knowledge base** that any domain expert can understand.

Rodger Knaus is a principal of Instant Recall, a Bethesda, Md. firm specializing in the development of Prolog-based applications.

Listing 1. Rules using logical conditions.

```
If: Initial test is {negative} then: No further evaluation is needed
If: Initial test is {positive} and: Biopsy contains {no abnormality}
then: Monitor again in 6 months
If: Initial test is {positive} and: Biopsy contains {abnormal cells}
then: Evaluate treatment options
```

Listing 2. Rules using state variables.

```
If: {STATE} = "Initial test" and: Initial test is {negative} then: No
further evaluation is needed
If: {STATE} = "Initial test"
If: Initial test is {positive} then: [STATE] := "Perform biopsy"
If: {STATE} = "Perform biopsy" and: Biopsy contains {abnormal cells}
then: {STATE} := Evaluate treatment options
If: {STATE} := "Perform biopsy" and: Biopsy contains {no abnormality}
then: Monitor again in 6 months
```

Listing 3. Rules using state variables

```
machine :
-   initialize,
    repeat,
        single_state.
single_state :
-   retract( current_state( STATE)), !,
    process( STATE ), fail.
single_state :
-   message($Computation concluded.$).
consider( STATE ) :
-   asserta( current_state( STATE)).
initialize:
-   consider( $Initial test$ ).
process( $Initial test$ ) :
-   when( $Initial test is$, $negative$), !,
    conclude( $No further evaluation is needed$ ).
```

```

process( $Initial test$ ) :
-   when( $Initial test$, $positive$ ), !,
    consider( $Perform biopsy$ ).
process( $Perform biopsy$ ) :
-   when( $Biopsy content$, $no abnormality$ ), !.
    conclude( $Monitor again in 6 months$ ).
process( $Perform biopsy$ ) :
-   when( $Biopsy content$, $abnormal cells$ ), !,
    consider( $Evaluate treatment options$ ).

```

Listing 4. **Indexing** rules by state.

```

initialize
    consider( Initial test$ ).
    clause( process( STATE ) , BODY ),
    recordz( STATE, BODYfail. initialize :- !.
process( STATE ) :
-   recorded( STATE, RULE_BODY, _),
    call( RULE_BODY ), !.
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```

5/3,AB/4
DIALOG(R)File 275:IAC(SM) Computer Database(TM)
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01516949 SUPPLIER NUMBER: 12202262 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Go with the flow. (combining expert systems and flowcharts to develop
 knowledge bases) (Expert's Toolbox) (Tutorial)
Knaus, Rodger
AI Expert, v7, n6, p17(3)
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ABSTRACT: The unlikely combination of expert systems and flowcharts can be useful for developing **knowledge bases** such as expert system shells and languages. While expert systems can be used to gather the necessary information to solve a particular problem, flowcharts help to summarize the data so that experts can inspect it for thoroughness. The expert's flowchart should be encoded using PROLOG and **knowledge-based** shells. The fundamental structure of the PROLOG flowchart program handles multiple answer questions. A **knowledge base** developed using expert systems and flowcharts is essentially a table with individual rows representing rules that match with individual lines on the flowchart. By requesting data in a form that enables experts to replay their experience, and by coding with states the experts offer, expert system developers can build a **knowledge base** that all domain

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Evaluating techniques for generating **metric**-based classification
trees. (technical)
Porter, Adam A.; Selby, Richard W.
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ABSTRACT: **Metric**-based classification trees provide an approach for identifying user-specified classes of high-risk **software** components throughout the **software** lifecycle. Based on measurable attributes of **software** components and processors, this empirically guided approach derives models of problematic **software** components. These models, which are represented as classification trees, are used on future systems to identify components likely to share the same high-risk properties. Example high-risk component properties include being fault-prone, change-prone, or effort-prone, or containing certain types of faults. Identifying these components allows developers to focus the application of specialized techniques and tools for analyzing, testing, and constructing **software**. A validation study using **metric** data from 16 NASA systems showed that the trees had an average classification accuracy of 79.3 percent for fault-prone and effort-prone components in that environment. One fundamental feature of the classification tree generation algorithm is the method used for partitioning the **metric** data values into mutually exclusive and exhaustive ranges. This study compares the accuracy and the complexity of trees resulting from five techniques for partitioning **metric** data values. The techniques are quartiles, octiles, and three methods based on least weight subsequence (LWS-chi) analysis, where chi is the upper bound on the number of partitions. The LWS-3 and LWS-5 partition techniques resulted in trees with higher accuracy (in terms of completeness and consistency) than did quartiles and octiles. LWS-3 and LWS-5 trees were not statistically different in terms of accuracy, but LWS-3 trees had lower complexity than all other methods in terms of the number of unique **metrics** required. The trees from the three LWS methods (LWS-3, LWS-5, and LWS-8) had lower complexity than did the trees from quartiles and octiles. In general, the results indicate that distribution-sensitive partition techniques that use only relatively few partitions, such as the least weight subsequence techniques LWS-3 and LWS-5, can increase accuracy and decrease complexity in classification trees. Classification analysis techniques, along with other empirically based analysis techniques for large-scale **software**, will be supported in the **Amadeus** measurement and empirical analysis system. (Reprinted by permission of the publisher.)